Spencer, director of the mineralogical department of the British Museum, in 1904.

GEORGE F. KUNZ

Optic Projection. Principles, Installation and Use of the Magic Lantern, Projection Microscope, Reflecting Lantern and Moving Picture Machine. By SIMON HENRY GAGE and HENRY PHELPS GAGE. The Comstock Press, Ithaca. 1914. Pp. 731. $3.00.

Professor Gage and his son, Dr. Gage, have written a timely and compendious treatment of optical projection that will be heartily welcomed by all who are interested in the subject. Such recent developments of the art of projection as cinematography and opaque projection are discussed at length, while the older ordinary forms of projection are not neglected.

The titles of the fifteen chapters are, in order: Magic Lantern with Direct Circuit; Magic Lantern with Alternating Current; Magic Lantern for Use on the House Electric Lighting System; Magic Lantern with the Lime Light; Magic Lantern with Petroleum Lamp, with Gas, Acetylene and Alcohol Lamps; Magic Lantern with Sunlight, Heliostats; Projection of Images of Opaque Objects; Preparation of Lantern Slides; The Projection Microscope; Drawing and Photography with Projection Apparatus; Moving Pictures; Projection Rooms and Screens; Electric Currents and their Measurement, Arc Lamps, Wiring and Control, Candle Power of Arc Lamps for Projection; Optics of Projection; Uses of Projection in Physics, Normal and Defective Vision. In addition there is given a historical outline of the origin and development of projection apparatus, a list of manufacturers of and dealers in projection apparatus, a bibliography and an index of both names and subjects. There are 413 cuts and diagrams.

The authors state that their aim has been to explain the underlying principles upon which the art of projection depends and to give such simple and explicit directions that any intelligent person can succeed in all the fields of projection. The point of view throughout is that of the skilled amateur. To the professional operator the treatment will appear academic, to the theorist it will appear very practical, but all will agree that it covers the middle ground clearly and exhaustively.

P. G. NUTTING

THE METEROLOGY OF ADELIE LAND, ANTARCTICA

THE climatic facts set forth by Sir Douglas Mawson in his interesting volumes, "The Home of the Blizzard," reviewed last week in SCIENCE, justify his claim that it is the stormiest spot on the face of the earth. Although the data as to the weather are desultory and incomplete, except as to the winds, yet a brief survey of this newly discovered land is of scientific interest. Fortunately the expedition was equipped with recording instruments for barometer, sunshine, temperature, wind, etc., so that data exist for full and satisfactory discussion of local meteorology in the promised scientific volumes. Observations were made at the main base, Commonwealth Bay, 67° S., 133° E., and by the sledging parties through King George Land.

No table of monthly means of any kind are given, but it is stated that the mean temperature for the first year was slightly above zero. This is an exceedingly low temperature for the latitude, 67° S. It is, however, not a local cold of radiation, but a cold of translation through the continuous and violent downflow of air from the elevated plateaus of Antarctica, 11,000 feet or more above sea level. The sharp pitch of the land is shown by the rise of 1,900 feet in fourteen and a half miles from the sea. The temperatures were never exceeding low, but were steadily maintained. The minimum temperature at the seacoast was only —28°, and the lowest observed on the ice-cap of the hinterland during the spring sledging was —35°; on September 18, 1912.

From a shaft excavated in the nevé of the hinterland, at an elevation of 2,900 feet, Bage calculated that the mean temperature of the snow, which would be higher than the air, for the year was approximately —16°. It would not be unreasonable from these data to place the mean annual temperature of the south-polar plateau at —40°. The contrast between temperatures during high winds and in pe-

riods of comparative calm are noticeable. On November 19, during good weather, at an elevation of 2,600 feet the temperature fluctuated between zero and 18°, but five days later with a wind of 40 miles per hour it sank to —10°. On December 18, at 5,500 feet, the temperature rose with fine weather twenty-four degrees in a day, while the black bulb registered 105° in the sun.

Wild's station, Queen Mary Land, 66° 30′ S., 95° E., about 1,200 miles to the westward of Mawson's on Adelie Land, appears from the few data available to be somewhat warmer, although the extremes were greater, a mimimum of —38° being reported on December 21, 1912. The monthly mean temperature for June, 1912, was —14.5°, and for July —1.5°, while the means for the German expedition, under Drygalski, about 150 miles to the westward, in 66° 2′ S., 89° 38′ E., in 1902 were 0.5° for June, —0.6° for July, and for a year 11.3°. From these comparative data the annual mean at Wild's station, Queen Mary Land, would be about 8°. Field observations on the glacier-covered hinterland show a minimum of —47°, and a reading of 87° on December 21, from a thermometer laid on an area of black rock. These data probably give an approximation to the annual mean temperature of slightly above zero, Fahrenheit, along the antarctic circle for say 2,000 miles, between 86° and 150° E. longitude.

Bearing on the intimate local relations between the winds and the temperatures of Adelie Land, Mawson says:

> The stronger the wind blew, the less variation did the thermometer show. Over a period of several days there might be a range of only four or five degrees. . . . The compression of the atmosphere during the gusts affected the air temperature so considerably that, coincident with their passages, the mercury column would be seen rising and falling through several degrees.

The only statement available as to the barometer reading runs:

> On July 11, 1913, there was an exceptionally low barometer at 27.794 inches. At the same time the wind ran riot once more—298 miles in three hours. The barometric curve, remarkably even, did not show as much range as one twentieth of an inch. The highest barometric reading was on September 3, 30.4 inches, and the comparison indicates a wide range for a station at sea-level. . . .

Annual barometric means in other portions of the Antarctic regions are as follows: *Discovery,* 77° 51′ S., 167° E., 1902–04, 29.29 inches; Cape Adare, Victoria Land, 2 months only, 29.134; *Belgica,* 70° 30′ S., 88° 30′ W., 1902–03, 29.307; *Gauss,* 66° 2′ S., 89° 38′ E., 1902–03, 29.134. The data of Mawson's expedition will have a bearing on the theory quite steadily advanced, but which the writer has been inclined to question, of a marked anticyclonic area over the vicinity of the South Pole.

The extreme violence of the winds, and the general prevalence of drifting snow have made it impossible to measure with any degree of definiteness the snowfall of Adelie Land. Heavy falls of snow occurred, one being mentioned as amounting in a day to two feet. Of the effect of the wind on the snow Mawson says:

> First, under the flail of the incessant wind, a crust would form, never strong enough to bear a man. Next day the crust would be etched, and small flakes and pellets would be carried away. Long shallow concavities would now be scooped out; these became deeper hour by hour, becoming at last the troughs between the crests of the snow-waves or sastrugi.

The abrasive effects of the drifting snow were astonishing. He adds:

> The southern, windward faces of exposed rocks were on the whole smooth and rounded; the leeward faces were rougher and more disintegrated. On the windward side the harder portions of the non-homogeneous rocks were raised in relief.

Of quantities he says:

> Day by day deluges of drift streamed by the Hut, at times so dense as to obscure objects three feet away, until it seemed as if the atmosphere were almost solid snow.

Mawson adds:

> A point which struck me was the enormous amount of cold communicated to the sea by billions of tons of low-temperature snow thrown upon

its surface, the water already at the freezing point.

The most remarkable feature of the climatic conditions of Adelie Land are the violence and constancy of the winds. They are hurricane in force and, from the data in these volumes, appear to have come invariably from the south-south-east. Their regularity was most remarkable, and the direction so constant that field parties traveled during blizzards and in semi-darkness by shaping their course relative to the wind. Indeed the wind—and the sastrugi formed by it—was a far better direction-guide than was the compass, affected by their proximity to the magnetic pole. The average hourly velocity of the wind for the first year—determined by a registering Robinson anemometer, was fifty miles. The average for March, 1912, was 49; April, 51.5, and May, 60.7 miles. Hourly velocities of 90 miles were not uncommon, and in a number of cases the rate exceeded 100 miles. The most remarkable winds—which from the snow carried by them assumed the character of blizzards—are as follows: 1912 (for the 24 hours), May 11, 80 miles; May 15, 90; May 22 (gust approximating 200 miles per hour, with temperature of —28°); 1913, May, 17 (24 hours), 83 miles; May 18, 93.7 (between 6 and 7 P.M. of the 18th the instrument recorded 103 miles); July 5, 116 miles in one hour, and an average of 107 miles for eight consecutive hours; July 11, 298 miles in three hours; August 16, 105 miles in an hour. Gusts were determined from time to time by an instrument called a puffometer, by which winds in gust were noted of an extreme velocity of about 220 miles, though necessarily such record could not be considered as absolutely accurate.

Meteorologists have usually associated whirlwinds with heated or desert regions. Mawson related:

> Whirlwinds of a few yards to a hundred yards or more in diameter which were peculiar to the country. The velocity of the wind in the rotating column being very great, a corresponding lifting power was imparted to it. The lid of a case, weighing more than 300 pounds, was whisked into the air and dropped fifty yards away. An hour afterwards the lid was picked up again, and struck against the rocks with such force that part of it was shivered to pieces.

Regions of calms sometimes obtained in a sheltered locality immediately under hurricane winds. One man working in a fifty mile gale at the Hut, on the upper cliffs, walked down to the harbor ice and suddenly found himself in an area of calm. As compared with the force of winds of the *Discovery*, 77° 51′ S., 167° E., 10.3 miles per hour, the winds of Adelie Land are nearly six times as violent. As to direction the *Discovery* winds as determined from the lower clouds showed 18 per cent. S., 15 S.W. and 15 S.E. At Cape Adare, with 10 per cent. calms, there were 20.4 per cent. winds from the S.E. and 13.9 from the S. These data seem to bring the S.S.E. winds of Adelie Land in harmony with those a few hundred miles to the southeast. The *Gauss*, 66° S., 90° E., was frozen-in a long distance from land so that its winds, 47.8 per cent. from the E., are not directly comparable with those 1,700 to 2,000 miles to the eastward.

It is evident that Mawson is justified in calling Adelie Land the *Home of the Blizzard*, and in claiming that it is the windiest region on the earth at the level of the sea. Meteorologists will look forward with interest to the publication of the full observations with their scientific discussion.

A. W. GREELY

REPORT OF THE COMMITTEE OF THE AMERICAN ASSOCIATION OF ANATOMISTS ON PREMEDICAL WORK IN BIOLOGY

AT the meeting of the American Association of Anatomists in Philadelphia, December, 1913, a committee was named by the president of the association to confer with the zoologists on the subject of work in biology preliminary to the study of medicine.

In accordance with the original motion of the chairman, which led to the appointment of this committee, the following report was submitted to the association December 29, 1914, at the St. Louis meeting:

Your committee was appointed to confer with the zoologists to ascertain what coopera-